

UNITED STATES PATENT APPLICATION

FOR

**METHOD AND SYSTEM FOR CATEGORIZING ITEMS IN BOTH
ACTUAL AND VIRTUAL CATEGORIES**

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**METHOD AND SYSTEM FOR CATEGORIZING ITEMS IN BOTH
ACTUAL AND VIRTUAL CATEGORIES**

[0001] The present application claims priority from U.S. provisional patent application number 60/199,731 entitled "Method and System for Categorizing Items in Both Actual and Virtual Categories" filed April 24, 2000.

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of database architecture and, more specifically, to the categorizing of database items in both an actual category and a virtual category.

BACKGROUND OF THE INVENTION

[0003] Web sites, or other network-based data aggregators or presenters, commonly use category schemas to provide context and structure for data items. For example, within an on-line web site directory, such as that presented by Yahoo! Incorporated of Santa Clara, California, web sites are commonly classified under an extensive category schema.

Within commercial web sites, product or service offerings are also commonly classified under a category schema so as to enable convenient user navigation of offerings to locate offerings of interest. For example, eBay, Incorporated of San Jose, California, implements an extensive

categorization schema for an on-line auction service. Specifically, a seller wishing to post an item for auction on the on-line auction facility is required to specify a category for the relevant product offering.

SUMMARY OF THE INVENTION

[0004] According to a first aspect of the present invention, there is provided a method of constructing a category structure within a database including defining a first structure of categories to classify a data item, the first structure including at least a first category. A second structure of categories is also defined to provide an alternative classification for the data item, the second structure including at least a second category. The second category is associated with the first category.

[0005] According to a second aspect of the present invention, there is provided a method of facilitating location of a data item within a database. User navigation of a first category structure, to select a first category, is facilitated. A second category of a second category structure is identified as being linked to the first category of the first category structure. Data items of the second category are identified responsive to the selection of the first category of the first category structure.

[0006] Other features of the present invention will be apparent from the accompanying drawing and from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0008] **Figure 1** is a block diagram illustrating an exemplary network-based transaction facility in the form of an internet-based auction facility 10.

[0009] **Figure 2** is a database diagram illustrating an exemplary database, maintained and accessed via a database engine server, which at least partially implements and supports the auction facility.

[0010] **Figure 3** is a representation of an item table, according to an exemplary embodiment of the present invention, that may include a category identifier corresponding to an identifier of one or more real categories defined within a category table of the database.

[0011] **Figure 4** is a diagrammatic representation of an exemplary category table, and of an exemplary category class, that may be instantiated as objects that reference a category table.

[0012] **Figure 5** is a diagrammatic representation of an exemplary populated category table, which is populated with exemplary records from both an

actual category as well as two virtual categories.

[0013] **Figure 6** is a conceptual diagram illustrating a view of selected actual categories and virtual categories within an exemplary database, as defined within one or more exemplary category tables.

[0014] **Figure 7** is a flow chart illustrating a method, according to an exemplary embodiment of the present invention, of constructing a category structure within a database.

[0015] **Figure 8** is a flow chart detailing a method, according to an exemplary embodiment of the present invention, of facilitating the location of a data item by navigation of a hierarchy of virtual categories.

[0016] **Figure 9A** provides an example of a markup language document that lists a number of top-level virtual categories.

[0017] **Figure 9B** illustrates an example of a markup language document that may present an exemplary list of mixed-level categories.

[0018] **Figure 9C** is an example of a markup language document that may be utilized to present both next level, or leaf, categories and data items identified to a user.

[0019] **Figure 10A** shows an exemplary user interface, in the form of a markup language document, that facilitates classification by a user of a data item according to actual categories.

[0020] **Figures 10B - 10E** illustrate a further interface via which a user may specify actual category information.

[0021] **Figure 11** is a diagrammatic representation of a machine, in the exemplary form of a computer system, within which a set of instructions for causing the machine to perform any of the methodologies discussed above may be executed.

DETAILED DESCRIPTION

[0022] A method and system for categorizing items in both actual and virtual categories are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details.

Terminology

[0023] For the purposes of the present specification, the term "transaction" shall be taken to include any communications between two or more entities and shall be construed to include, but not be limited to, commercial transactions including sale and purchase transactions, auctions and the like.

[0024] The term "virtual category" shall be understood to be a category that, for a particular data item, is not directly recorded as being associated with the data item. Nonetheless, a "virtual category" may, for a further data item, be directly recorded as an appropriate category, and for such a further data item will comprise an "actual category" (or a "real category").

Transaction Facility

[0025] Figure 1 is block diagram illustrating an exemplary network-based transaction facility in the form of an Internet-based auction facility 10. While an exemplary embodiment of the present invention is described within the

context of an auction facility, it will be appreciated by those skilled in the art that the invention will find application in many different types of computer-based, and network-based, commerce facilities.

[0026] The auction facility 10 includes one or more of a number of types of front-end servers, namely page servers 12 that deliver web pages (e.g., markup language documents), picture servers 14 that dynamically deliver images to be displayed within Web pages, listing servers 16, CGI servers 18 that provide an intelligent interface to the back-end of facility 10, and search servers 20 that handle search requests to the facility 10. E-mail servers 21 provide, *inter alia*, automated e-mail communications to users of the facility 10.

[0027] The back-end servers include a database engine server 22, a search index server 24 and a credit card database server 26, each of which maintains and facilitates access to a respective database.

[0028] The Internet-based auction facility 10 may be accessed by a client program 30, such as a browser (e.g., the Internet Explorer distributed by Microsoft Corp. of Redmond, Washington) that executes on a client machine 32 and accesses the facility 10 via a network such as, for example, the Internet 34. Other examples of networks that a client may utilize to access the auction facility 10 include a wide area network (WAN), a local area network (LAN), a wireless network (e.g., a cellular network), or the Plain Old Telephone Service (POTS) network.

Database Structure

[0029] **Figure 2** is a database diagram illustrating an exemplary database 23, maintained by and accessed via the database engine server 22, which at least partially implements and supports the auction facility 10. The database 23 may, in one embodiment, be implemented as a relational database, and includes a number of tables having entries, or records, that are linked by indices and keys. In an alternative embodiment, the database 23 may be implemented as collection of objects in an object-oriented database.

[0030] Central to the database 23 is a user table 40, which contains a record for each user of the auction facility 10. A user may operate as a seller, buyer, or both, within the auction facility 10. The database 23 also includes item tables 42 that may be linked to the user table 40. Specifically, the tables 42 include a seller items table 44 and a bidder items table 46. A user record in the user table 40 may be linked to multiple items that are being, or have been, auctioned via the facility 10. A link indicates whether the user is a seller or a bidder (or buyer) with respect to items for which records exist within the item tables 42.

[0031] The database 23 also includes one or more category tables 47. Each record within the category table 47 describes a respective category. In one embodiment, a specific category table 47 may describe multiple, hierarchical category structures, and include multiple category records, each of which may describe the context of a particular category within the one of the multiple hierarchical category structures. For example, the category table 47

may describe a number of real, or actual, categories to which item records, within the item tables 42, may be linked. For example, as shown in **Figure 3**, an item table 42 may include a category identifier 62 corresponding to an identifier of one or more real categories defined within the category table 47.

[0032] The category table 47 may also define a number of "virtual" hierarchical category structures that support alternative navigation paths that may be presented to a user to locate a particular item. In one embodiment, categories of a "virtual" hierarchical category structure are not directly referenced within item records within the item tables 42, but are instead linked to "real" categories. Accordingly, in one embodiment, no category identifiers 62 within the item tables 42 point directly to a "virtual" category. As will be described in further detail below, multiple virtual categories may be linked to a single real category.

[0033] The database 23 also includes a note table 48 populated with note records that may be linked to one or more item records within the item tables 42 and/or to one or more user records within the user table 40. Each note record within the table 48 may include, *inter alia*, a comment, description, history or other information pertaining to an item being auction via the auction facility 10, or to a user of the auction facility 10.

[0034] A number of other tables are also shown to be linked to the user table 40, namely a user past aliases table 50, a feedback table 52, a feedback details table 53, a bids table 54, an accounts table 56, an account balances table 58 and a transaction record table 60.

Category Table and Hierarchical Category Structures

[0035] **Figure 4** is a diagrammatic representation of an exemplary category table 47, and of an exemplary category class 70 that may be instantiated as objects that reference the category table 47.

[0036] The category table 47 is shown to include a number of fields, each of which may be populated with relevant information for a category record within the category table 47. For each category record, a marketplace field 68 indicates a particular marketplace (e.g., automobiles, computers, collectibles, etc.) within the context of the network-based auction facility 10 to which the category pertains. An identifier field 72 contains a unique category identifier for each category record. A name field 74 similarly includes a name (which need not be unique) for the relevant category.

[0037] An IS_LEAF field 76, for each category record, is populated with a character that indicates whether the relevant category is a leaf category of a particular hierarchical category structure (e.g., an actual or virtual category structure). The level1-level4 fields 78-84 record the category identifiers of categories from which a particular category depends within the context of hierarchical category structure. For example, the level1 field 78 will record the category identifier for an immediate parent category, while the level2 field 80 will record the category identifier for a grandparent category.

[0038] An actual_category field 86 is, in one embodiment, only populated for a virtual category, and stores the category identifier of an actual (or real)

category to which the relevant virtual category is linked.

[0039] **Figure 5** is a diagrammatic representation of an exemplary populated category table 47, that is populated with exemplary records for both an actual category 90, as well as two virtual categories 92 and 94.

[0040] Turning first to the hierarchy of actual categories 90, a parent (passenger vehicle) category includes a "Ford" child category, the "Ford" category being indicated as a child of the "passenger car" category by inclusion of the category identifier (e.g., 50) within the level1 field 78 of the record for the "Ford" category. The "Ford" category in turn is shown to include a "Taurus" sub-category and a "Model T" sub-category. It will be noted the "Taurus" and the "Model T" categories are indicated in the IS-LEAF field 76 as being leaf categories of the hierarchy of actual categories 90. It will furthermore be noted that, for each category within the hierarchy of actual categories 90, the actual_category field 86 contains a null value, as these categories are not linked to, and do not point to, further categories.

[0041] Turning now to the hierarchy of virtual categories 92, a parent "cars" category is defined to have a "Ford" child category, that in turn is defined to have a "Taurus" child category. It will be noted that the level1 field 78 of the "Ford" category includes an identifier pointing back to the parent "cars" category.

[0042] The "Taurus" category of the virtual categories 92 is also shown, within the actual_category field 86, to include the identifier of the "Taurus" category of the actual categories 90. In this way, the virtual "Taurus"

category, identified by the category identifier "8001" is linked to, or points to, the actual "Taurus" category identified by the category identifier "8000". In this way, user navigation of the hierarchy of virtual categories 92, when resulting in the selection of the virtual "Taurus" category, can be utilized to identify the category identifier for an actual "Taurus" category, that can in turn be utilized to identify records within an item table 42.

[0043] Similarly, the hierarchy of virtual categories 94 is headed by a "vintage cars" category that includes a child "Ford" category and a grandchild "Model T" category. The "Model T" category is again linked, by an appropriate category identifier within the actual_category field 86, to the actual "Model T" category of the actual categories 90.

[0044] It will furthermore be noted that, in one embodiment, only real categories are indicated in the IS_LEAF field 76 as being leaf categories.

[0045] In one embodiment of the present invention, as mentioned above, data items may only be categorized under a hierarchy of actual categories 90, and not under a hierarchy of virtual categories. It is for this reason that only actual categories may be indicated as leaf categories.

[0046] While the hierarchies of virtual categories 92 and 94 are indicated as being distinct hierarchies, these hierarchies may in fact be sub-hierarchies of a larger hierarchy of virtual categories. Nonetheless, the present application contemplates that the category table 47 may define multiple hierarchies of virtual categories, and that multiple virtual categories may be linked to, or pointed to, a single actual category.

[0047] **Figure 6** is a conceptual diagram illustrating a view of selected actual categories 100 and virtual categories 102 within an exemplary database, and as defined within one or more exemplary category tables 47. As illustrated, both the actual categories 100 and the virtual categories 102 are shown to include parent, child and grandchild categories. The grandchild categories, in the illustrated example, are "leaf" categories for both the actual and virtual categories 100 and 102. Leaf categories of the virtual categories are shown to be linked to appropriate "leaf" categories of the actual categories 100.

Methodologies

[0048] **Figure 7** is a flow chart illustrating a method 110, according to an exemplary embodiment of the present invention, of constructing category structures within a database. The database may, in one exemplary embodiment, support a web site that classifies data items for presentation to a user via a browser. Such data items may describe, for example, web sites, products, services or any other items that may be categorized so as to facilitate convenient location by a user. In one embodiment, the data items may describe goods and services that are offered for sale via an auction process by the network-based auction facility 10. However, it will readily be appreciated that the present invention is not limited to use in such an exemplary facility.

[0049] The method 110 commences at block 112 with the definition, for example by a database designer, of a hierarchy of "actual" categories 100

being described by a respective category records that each specify a category identifier.

[0050] At block 114, the database designer then defines at least one hierarchy and multiple hierarchies, of "virtual" categories 102 within the category table 47. In one embodiment, the virtual categories are not intended to be presented to a user for selection to categorize a data item, but are linked, in the manner described above, to actual categories.

[0051] At block 116, in an actual_category field 86 for each "leaf" virtual category, the database designer includes a pointer (or link) in the form of a category identifier to a "actual" leaf category.

[0052] **Figure 8** is a flow chart detailing a method 120, according to an exemplary embodiment of the present invention, of facilitating the location of a data item by navigation of a hierarchy of virtual categories.

[0053] The method 120 commences at block 122, with the presentation to a user of a list of top-level virtual categories. For example, the top-level categories may be the parent categories of the virtual categories 102 illustrated in **Figure 6**. The top-level categories may furthermore be presented in the form of a markup language document (e.g., a HTML document) that is generated by a page server 12 utilizing category information retrieved by the database engine server 22 from the database 23.

Figure 9A provides an example of such a markup language document 138, which lists a number of top-level virtual categories 140.

[0054] At block 124, user selection of a virtual category is detected. For

example, by performing a "point-and-click" operation utilizing a cursor control device, a user may select the "cars" category of the virtual categories 140 shown in **Figure 9A**, the selection being communicated to a CGI server 18 that in turn communicates the selection to an appropriate CGI script.

[0055] At block 126, a list of next-level virtual category is presented, based on the virtual category selected at block 124. **Figure 9B** illustrates an example of a markup language document that may be utilized to present an exemplary list 144 of such mixed-level categories. For example, a CGI script executing within a CGI server 18 and responsive to identification of a user-selected top-level category, may, via the database engine server 22, query the category table 47 to identify virtual categories that are child categories of the "cars" category. The results of this query are then communicated to a page server 12 that populates a template to generate the markup language document illustrated in **Figure 9B**. The list 144 of virtual categories shown in **Figure 9B** accordingly represents child categories of the "cars" virtual category.

[0056] At block 128, a user selection of a next-level virtual category is detected, in the same manner described above. For example, assuming user selection of a hypertext link 146 for the "Ford" category of the list 144 of categories shown in **Figure 9B**, this user selection may be communicated to a CGI server 18.

[0057] At block 130, a leaf category, or leaf categories, of the virtual category selected at block 128 may, in one embodiment, be identified so as to facilitate

presentation of all data items associated with that leaf category or categories. For example, all leaf categories that depend from the virtual "Ford" category selected at block 128 may be identified. Such leaf categories may include the virtual "Taurus" category or the virtual "Model T" category discussed above with reference to **Figure 5**.

[0058] Where the category selected at block 128 itself comprises a leaf category, it will be appreciated that such a category itself be identified as the leaf category at block 130.

[0059] At block 132, a mapping, or linking, operation is performed so as to map the relevant virtual leaf categories identified at block 130 to actual leaf categories. Specifically, as described above, this mapping operation may be performed utilizing a category identifier included within the `actual_category` field 86 of each relevant virtual category.

[0060] Having then identified one or more actual leaf categories corresponding to the virtual leaf categories, at block 134, data items categorized as being attributed to the identified real leaf categories are identified and presented in a user interface.

[0061] **Figure 9C** is an exemplary embodiment of a user interface, in the form of a markup language document, that may be utilized to present both the next level, or leaf, categories identified at block 130 and the data items identified at block 134 to a user. Specifically, the next level virtual categories are shown to be presented at 150, and the identified data items are shown to be presented at 152. It will be noted that the data items presented at 152

include data items within all of the virtual leaf categories listed at 150.

Accordingly, the list of data items 152 may be extensive. For this reason, a user may wish to further navigate the hierarchy of virtual categories to further limit the list of data items 152 to a more manageable size.

[0062] Returning to **Figure 8**, at decision block 136, a determination is made as to whether a user selected a virtual leaf category at block 128. If the selected virtual category is not a leaf category, the method 120 loops back through blocks 126-134. For example, a user may select a hypertext link 154 for the virtual "Taurus" category, responsive to which the user will be presented, at block 134, with a list of data items identified as being within the actual "Taurus" category by performing a link between the virtual "Taurus" category and the actual "Taurus" category.

[0063] **Figure 9D** is an exemplary user interface, in the form of a markup language document, that illustrates the presenting of such a narrowed list of data items at 156. It will furthermore be noted that the user interface shown in **Figure 9D** does not provide a list of any child categories, as were shown at 150 in **Figure 9C**, as the virtual "Taurus" category is a leaf category.

User-Classification of a Data Item - User Interfaces

[0064] As described above, in one embodiment, a user (e.g., a seller) utilizing the network-based auction facility 10 or an administrator classifying data items for presentation via a web site, may be presented with the option of only classifying data items within the context of a hierarchy of actual (and

not virtual) categories.

[0065] **Figure 10A** shows an exemplary user interface, in the form of a markup language document, that facilitates classification by a user of a data item according to actual categories 100, such as those shown in **Figure 6**. The top-level (or parent) actual categories comprise vehicle types (e.g., a passenger vehicles, commercial trucks, boats, aircraft, etc.). Selection of a passenger vehicle type utilizing a drop-down menu 162 indicates both an actual parent category and an actual child category. Alternatively, the user (i.e., seller) may be offering a further vehicle type for auction. User selection of the drop-down menu 164 allows the seller to specify such a further vehicle type.

[0066] **Figures 10B-10E** illustrates a further user interface 170 via which a user (i.e., a seller) may specify actual category information. In an exemplary embodiment, the information inputted by the user at block 172, as shown in **Figure 10B**, specifies an actual category. Specifically, for passenger vehicles, a leaf category is defined by a passenger vehicle make and model.

[0067] It should thus be noted that, in the exemplary embodiment, data items are classified according to a selected leaf category. Such leaf categories may be viewed as a category path selected within the context of a hierarchy of categories. For example, the full categorization of a data item may be viewed as the "passenger vehicle/Ford/Taurus" categorization.

Software

[0068] The methodologies described above may, it will be appreciated, be performed by software modules residing and executing on a wide variety of machines. In one embodiment, the mapping of the virtual leaf categories to actual leaf categories may be performed by a "listings produce" module or object that issues a series of SQL statements against the database 23. The "listings produce" object may reside, for example, on a CGI server 18 or be part of the database engine server 22.

[0069] **Figure 11** shows a diagrammatic representation of a machine in the exemplary form of a computer system 300 within which a set of instructions, for causing the machine to perform any one of the methodologies discussed above, may be executed. In alternative embodiments, the machine may comprise a network router, a network switch, a network bridge, Personal Digital Assistant (PDA), a cellular telephone, a web appliance or any machine capable of executing a sequence of instructions that specify actions to be taken by that machine.

[0070] The computer system 300 includes a processor 302, a main memory 304 and a static memory 306, which communicate with each other via a bus 308. The computer system 300 may further include a video display unit 310 (e.g., a liquid crystal display (LCD) or a cathode ray tube (CRT)). The computer system 300 also includes an alpha-numeric input device 312 (e.g. a keyboard), a cursor control device 314 (e.g. a mouse), a disk drive unit 316, a signal generation device 320 (e.g. a speaker) and a network interface device

[0071] The disk drive unit 316 includes a machine-readable medium 324 on which is stored a set of instructions (i.e., software) 326 embodying any one, or all, of the methodologies described above. The software 326 is also shown to reside, completely or at least partially, within the main memory 304 and/or within the processor 302. The software 326 may further be transmitted or received via the network interface device 322. For the purposes of this specification, the term "machine-readable medium" shall be taken to include any medium that is capable of storing or encoding a sequence of instructions for execution by the machine and that cause the machine to perform any one of the methodologies of the present invention. The term "machine-readable medium" shall accordingly be taken to include, but not be limited to, solid-state memories, optical and magnetic disks, and carrier wave signals.

[0072] Thus, a method and system for categorizing items in both actual and virtual categories have been described. Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.